[EJ] Evening Poster | S (Solid Earth Sciences) | S-TT Technology & Techniques

[S-TT49]Airborne surveys and monitoring of the Earth

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Airborne surveys are useful to better understand the whole and/or the detailed structures of the Earth and their variations. They can be implemented from a traditional manned and newly-developed unmanned aircraft to efficiently map very large or remote areas with difficult access. We invite studies on theory, instrumentation, processing, modeling or inversion and applications of airborne surveys.

[STT49-P05]Drone-borne 3-dimensional measurement instrument for PM2.5 and harmful gases in the atmospheres such as polluted areas and volcano craters

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Drone-borne 3-dimensional measurement instrument for PM2.5 and harmful gases in the atmospheres such as polluted areas and volcano craters

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1. Outline of drone terrain survey and atmospheric component observation

Conventional field survey and topography surveying have constraints "Human enters the site by carrying equipment, measures and moves", and it was difficult to achieve both high efficiency survey work and high accuracy survey at the same time, but in recent years The drone made it possible to achieve this compatibility. It is very difficult to fly by low-speed airplane with fixed wing aircraft or helicopter, and easy stopping in the air is advantageous for fine aerial photography. It is possible to perform close observation and measurement survey of the steep cliff, the caved landform, the vertical hole, and the side hole with crack, landslide, vertical wall surface, overhang. Also, by installing a small gas measurement device in the drone, atmospheric observation in the no-entry area becomes possible. Only fixed point observation can be done for measuring instruments installed on the ground. With drone, it is possible to measure the three-dimensional distribution of atmospheric constituents.

2. Actual observation by drone in Aso

Three-dimensional measurements of particulate matter and gas components in the atmosphere using a drone flying object are performed.

2-1. Aso volcano west lava field investigation

1. Atmospheric observation of lava field: Detection and measurement of volcanic gas with a drone mounted gas sensor
2. Photogrammetry of lava field by drone: Three-dimensional data measurement of terrain
3. Installation of volcanic gas measuring instruments on lava field by drone

2-2. Operation of Drone

Drone model
DJI Matrice 600
DJI Phantom 3 Advanced
DJI Phantom 4 Pro

1) Measurement with compact PM 2.5 meter (0.3 kg)
Space measurement using small drone (Phantom 3,4)

2) Measurement by particle size distribution measuring device (1.5 kg)
Spatial measurement using a relatively large drone (Matrice 600)

3) Measurement of various kinds of particle / gas components with sensors (1.7 kg)
Measurement using a relatively large drone (Matrice 600)

2-3. Many types of sensors to be mounted

PM 2.5: Small size sensor of Panasonic
CO2: NDIR infrared sensor (Sense Air company)
NO, Ox, CO, SO 2, NO 2: electrochemical sensor (Alphasense)
Test of Alphasense B type sensor

Actually, the electrochemical sensor has no selectivity depending on the type of gas.The CO sensor is referred to as a CO sensor since it leaves only about CO when an activated carbon filter is attached to the head of the sensor.Because SO 2 and NO 2 are gases of similar nature, there is no filter to distinguish.

[Future]
Measurement of fine particles and chemical components in the atmosphere is also measured in Mars exploration.
I would like to consider the method of performing 3D measurement with Martian drone.